

The

HOMEOWNERS'

Guide

TO USING

WATER WISELY



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How can we all save water?

We live in a desert

Tucson is located in the Sonoran Desert, a place rich with unique plant and animal species and a high quality of life, but with few natural water resources. We receive an average of just 12 inches per year. Being efficient with our water resources will help us live in harmony with our environment.

Tucsonans are known for their strong environmental ethic and have a long and proud tradition of being water efficient. Our combined average daily residential and nonresidential water consumption (known as “per capita” water consumption—gallons per capita per day—gpcd) is generally 160 gallons. That’s far below average rates in other parts of Arizona and the western United States.

Water conservation, along with Colorado River water, effluent (treated wastewater) and groundwater, is an important element of our long range water resource plans. Right now, we are relying solely on groundwater and our current population is using this resource two-and-a-half times faster than it can be naturally replenished.

Saving water saves (you) money

In addition to being the “right thing to do,” being efficient can save us all money, another scarce resource. As the community grows, being water efficient helps Tucson Water delay investing in new infrastructure such as pipes, wells and reservoirs by stretching the useful life of our existing facilities. This helps keep water rates from increasing. More directly, using less water will save you money on not only on your monthly water bill, but also on your sewer bill and, in many cases, on your energy bill. The rate of return on investments in water conservation often exceed 10% per year.

Tucson Water conservation programs

Tucson Water’s Conservation Office was formed in 1990 to provide additional support to utility customers. Because conserving water is everyone’s job, our programs will provide hands-on assistance to all customer classes: single-family, multi-family, commercial, and industrial. This guide, however, is designed to help our single family customers reduce their water use.

How to use this manual

Saving water doesn't have to be complicated or expensive. It can be as simple as turning off the water while you brush your teeth, doing full loads of clothes or dishes, and sweeping instead of hosing patios and walkways. Or, it can include finding and repairing leaks, installing water-saving plumbing fixtures, landscaping with low-water-use plants, and installing a drip irrigation system. This manual suggests a variety of ways to save water and shows you how to calculate your daily water use. Think about how water is used in your household. Maybe you can make some practical water-saving changes in your daily routine.

For more information

In addition to this booklet, Tucson Water's Conservation Office has a variety of other publications to help you. For more information, call 791-4556. Or, visit our web site for up coming events at <http://www.ci.tucson.az.us/water>


How much water do you use?

A family of three in Tucson uses an annual average of 112 gallons per person per day, or approximately 10,000 gallons combined per month. Do you know how much water you use? To find out, all you need is a copy of your most recent water bill.

Amount Due

Locations to pay your current bill in person

Monthly water use graph




P.O.Box 28811
Tucson, AZ 85726-8811
Phone: 791-3242

SERVICES STATEMENT

Customer Service Office
310 W. Alameda, Tucson, AZ 85701

Outside Tucson Area Call: (Toll Free 1-800-598-9449)
COMMERCIAL REFUSE SERVICE INQUIRY PHONE: 791-3272



PIMA COUNTY
WASTEWATER MANAGEMENT
PIMA COUNTY
WASTEWATER MANAGEMENT
201 N. Stone Avenue
Tucson, AZ 85701
Phone: 740-6609

Service Address: 400 East Calle Camino
Customer Name: I. M. Customer

Account Number: 00000-00000

Reading Date: 0-0-00
Bill Date: 0-0-00

MESSAGES	MONTHLY SUMMARY
Different messages each month give you important information!	Last Bill Amount
	Payment, thank you
	Balance due 1-3
	Pima County Sewer Water
	Other Charges
	CURRENT CHARGES DUE 0-0
	TOTAL AMOUNT DUE

Services Statement - Continued

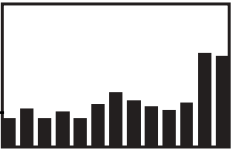
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PIMA COUNTY ITEMIZED SEWER CHARGES BILL PERIOD = 30 DAYS

SEWER FLOW VOLUME	10.00	ADMINISTRATIVE CHRG	2.18
		SEWER RESIDENTIAL	8.60
		TOTAL:	\$10.78

CITY ITEMIZED WATER VOLUME CHARGES BILL PERIOD - 30 DAYS METER NUMBER: 000000000

Water Usage In gallons In ccfs	CURRENT READING	1468	MONTHLY SERV CHRG	5.30
This month 14960 20	WATER USED IN CCF	20	RESID2 BASE 0-3 CCF	0.00
last month 16456 22			VOL \$1.62@12.00	19.44
This mo. last yr. 3740 5			VOL \$2.61@5.00	13.05
			CAP CHARGE	.40
			TOTAL:	\$38.19



MISCELLANEOUS CHARGES BILL PERIOD = 30 DAYS

SEWER FLOW VOLUME	5.33	TAX	1.99
		TOTAL:	\$1.99

How to compute your daily water consumption from your water bill

- 1. Find the total gallons figure. This figure is the amount of water your household used during the past month.
- 2. Divide the gallons figure by 30 (average number of days/month). Then divide that sum by the number of people in your family to obtain the number of gallons each of you use per day.

Are you above average?

The chart below shows estimated monthly water use by household size and season. Where do you fit in? Remember, the figures below are estimates and your water use could be higher than the averages if you have a swimming pool or do extensive outdoor watering.

Table 1: Water use, rates, and temperature--the more you use, the more you pay

	WINTER (Nov.-April)			SUMMER (May-Oct)		
Household size	Aver. Monthly Water Use per Household	Aver. Daily Water Use per Person	Average Bill*	Aver. Monthly Water Use per Household	Aver. Daily Water Use per Person	Average Bill*
1	2992	100	\$ 7.49	6732	224	\$ 16.26
2	5236	87	12.75	8976	150	21.53
3	8228	91	19.77	11968	133	29.61
4	10472	87	25.04	14212	118	38.05
5	13464	90	35.24	17204	115	49.31
6	16456	91	46.49	20196	112	60.56
7	18700	89	54.93	22440	107	69.00
8	21692	90	66.19	25432	94	83.17

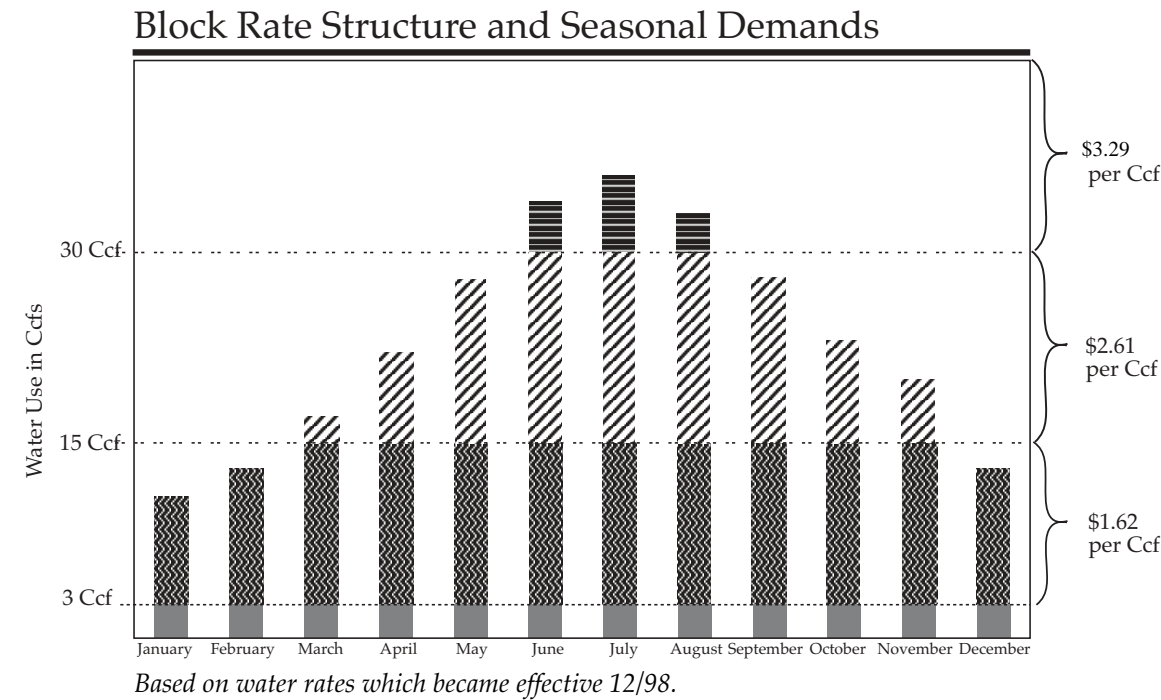
**This figure appears as "total current charges—water" on your bill. It does not include sewer charges. Bill estimates based on water rates which became effective 12/98.*

As you read the chart, did you notice how water use and the amount of your water bill increased during the summer? There are two main reasons. One reason is that the warmer the weather, the more water you generally use, especially if you do extensive outdoor watering, operate an evaporative cooler, top off your swimming pool, or operate a mist system. The other reason your bill increases during the summer is Tucson Water’s residential rate schedule.

How is my bill calculated

Tucson Water sells water in units known as Ccfs. Each Ccf equals 100 cubic feet of water, or 748 gallons. Your bill is calculated by multiplying the number of Ccfs you use during a month by the rate charged for each Ccf.

Residential customers are charged under an “increasing block rate” system. Within each block each Ccf costs the same. The cost per Ccf increases with each higher block. In other words, your 16th Ccf costs you more than your 15th Ccf. So, if your water use goes up in the summer, which it usually does, your water bill could go up even faster than your usage, if your usage enters the next higher rate block. (Each month, the cost your first 3 Ccfs is included in your monthly service charge.) This rate structure has the effect of charging high volume customers more per unit than low volume users. This effect can be seen in the graph below.



As can be seen in the graph above, this customer pays \$3.29/Ccf for that part of their usage which is over 30 Ccf in June, July, and August. Someone who uses no more than 15 Ccf, would pay \$1.62/Ccf. Most of our customers use from about 10 Ccf in the lowest winter month to around 19 Ccf during the highest summer month. Very few customers actually use over 30 Ccf, and those that do, pay a premium, as can be seen in the graph.

Reading your water meter

Reading your water meter

Your water meter (usually located in the ground at the front curb, or in the alley) measures the amount of water used in your household. It's a good idea to learn how to read it should you want to verify the monthly reading on your water bill. Your water meter also can be used as a "leak detective." See the section "Ways to Save Indoors," page 7, to learn how to use your water meter to help locate leaks.

How to read it

Most water meters use straight-reading dials (like the one pictured above) which are read the same way you read your car's odometer. The meters measure water use in cubic feet (one cubic foot equals 7.48 gallons.) As Tucson Water calculates water bills based on hundreds of cubic feet (Ccf) or per 748 gallons, the last two digits on the meter dial are dropped when the meter is read. For more help in reading your meter, please call 791-3242.

How to verify your monthly reading

Tucson Water employees read your meter about the same day each month. The date the meter was read appears at the top of your bill. The reading is recorded in Ccf as Water Usage. To verify your monthly reading next month, read your meter on the same day it was read the previous month. Subtract your previous reading from this new reading to obtain your monthly water use. Remember to multiply the sum by 748 to convert to gallons.

The Billing Office can help you locate and read your meter. Call 791-3242 for more information.



*Straight-reading meter
This meter reads: 148 Ccfs*



Ways to save indoors:

- ✓ *Find and repair leaks*
- ✓ *Install water-saving plumbing fixtures*
- ✓ *Modify existing fixtures*
- ✓ *Service your evaporative cooler regularly*
- ✓ *Change your water-use habits indoors*

The first section of this chapter focuses on saving water indoors.

Find and repair leaks

Leaks are major, but often silent water-wasters which cost you money each day they go uncorrected. A leaky faucet or toilet can waste 15-100 gallons per day, depending on the size of the leak.

Use your water meter to detect leaks

Your water meter can help you determine whether your water-using fixtures have inconspicuous leaks. It's the best place to begin your search.

1. Turn off all faucets and water-consuming appliances, including evaporative coolers and ice-makers in refrigerators.
2. Find the dial on the meter which shows the smallest unit of measure. Check the needle's position on the dial and check the time. If you can see the smallest dial changing, then you may have a significant leak. The blue triangle dial on the face of your water meter, turns with low flow thru the meter and makes it easier to detect when water is moving thru the meter.
3. Read the meter again after 15-30 minutes. If the meter registers a greater amount than before, you have a leak.

How do you decide whether there is a leak somewhere inside the house, or between the water meter and the house? Turn off your house valve and if the needle on the water meter's dial continues to move, you probably have a leak between your house and the water meter. If the dial has not moved, you have a leak within your house. Consider contacting a plumber to check the problem.

Even if your meter did not show any signs of leaks in your home, it's still a good idea to periodically check for leaks. Start with your toilets and faucets.

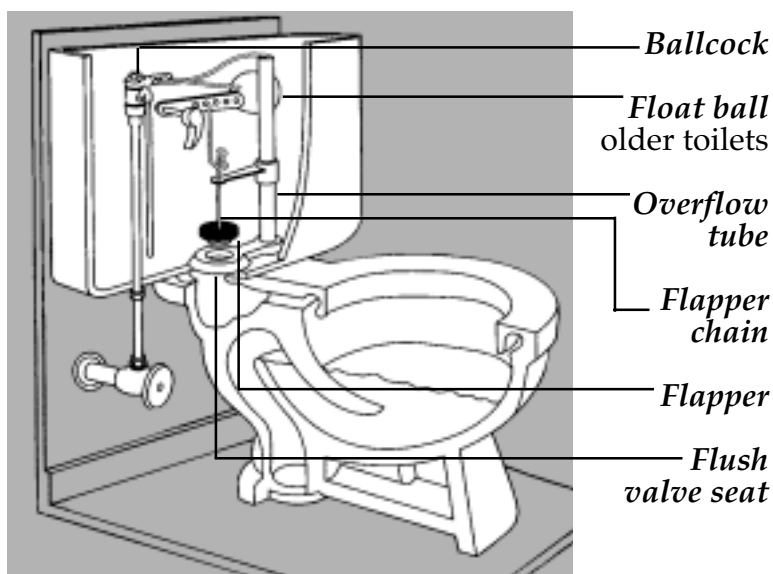
Finding & repairing leaky toilets

Find and repair leaking toilets

Toilets are one of the biggest but often the most inconspicuous water-wasters.

Approximately 20% of all toilets leak. To check if your toilet is a water-waster, remove the toilet tank lid and place a few drops of food coloring in the tank water. Wait at least 15 minutes, then check the bowl. If

color shows in the bowl without flushing, you have a leak. If you use an in-tank toilet cleaner, temporarily remove it to conduct the food coloring test.



Consult the guide below to help pinpoint the cause of a leak. If you have to make repairs, turn off the water valve below the toilet and flush to empty the tank. Sponge out excess water.

■ *Problem: Toilet runs continuously (may produce a gurgling sound)* *Possible causes:*

1. Float arm not adjusted properly. If your toilet has a float arm and ball, gently bend the arm down and away from the tank wall to see if water flow stops after the toilet is flushed. If the toilet still runs, you may need to replace the float arm and ball. Check to see if the flapper is sealing properly before you change the float arm and ball.
2. Water-filled float arm ball. If your float arm ball is filling with water, unscrew it from the arm and replace it with another ball.
3. Flapper (also known as “flapper valve,” “flapper ball,” “flush valve ball,” or “tank stopper”) isn’t seating properly or it is sticking open. Most flappers operate efficiently for only a few years before they become misshapen and leak-prone. While you flush your toilet, check to see if the flapper falls straight down to stop the flow of water from the toilet tank. If it doesn’t, replace the flapper. Flappers should be replaced every 3-5 years!
4. Flush valve seat corroded. Clean valve seat with fine steel wool or replace it.

5. Overflow tube is cracked. Replace it.
6. Malfunctioning ballcock (water refill mechanism). Replace washers in the top of the ballcock, or replace entire ballcock.

■ ***Problem: Toilet “flushes by itself”***

Possible causes:

1. Flapper isn’t seating properly; sticking open (see 3., above).
2. Malfunctioning ballcock (see 6., above).

■ ***Problem: Leak between toilet tank and bowl.***

Possible cause:

1. Leaking gasket. First, gently tighten the locknuts under the toilet tank. If a leak still exists, replace the circular rubber gasket between the toilet tank and bowl.

■ ***Problem: Flapper closes before tank empties.***

Possible cause:

1. Misadjusted flapper chain. Adjust chain or guide wire (in older toilets) connected to the flapper until you achieve a proper flush.

Before you start repairs, consult a basic plumbing repair guide, available at the public library or at most home improvement stores. If you need more assistance, call a plumber.

Repair leaking faucets

Faucet leaks are obvious. Most leaks usually can be fixed by replacing a washer or other parts. Here’s some quick tips to repair two types of faucets; one with a washer, and one without. Before you do any repairs, turn off all water supplies to the faucet and open one or both faucet handles to release the remaining water. Your local home improvement or hardware store should carry an inexpensive selection of replacements. However, selecting replacement parts can be tricky because of the large variety of faucets on the market. Make sure you purchase the correct parts. It’s a good idea to take the worn-out washer or other parts to the store with you so staff can help you find the right part. When you are doing repairs, lay the faucet parts aside in the order you removed them for easier reassembly.

Repairing faucets with washers

One common faucet design has two handles and one spout. This kind of faucet closes by a screw pushing and compressing a washer against a valve seat.

To repair a faucet with a washer

1. Decide whether the leak is coming from the hot or cold water side.
For convenience sake, you may want to go ahead and replace washers in both handles.
2. Remove decorative cover and handle.
3. Remove the packing nut and stem nut with a wrench.
4. Remove faucet stem, then remove old washer with a screwdriver.
5. Install the new washer and reassemble the faucet, starting with the last piece you removed. Before replacing the packing nut, lubricate the threads of the stem and nut with petroleum jelly. Tighten the packing nut and replace the handle.

Repairing washerless faucets

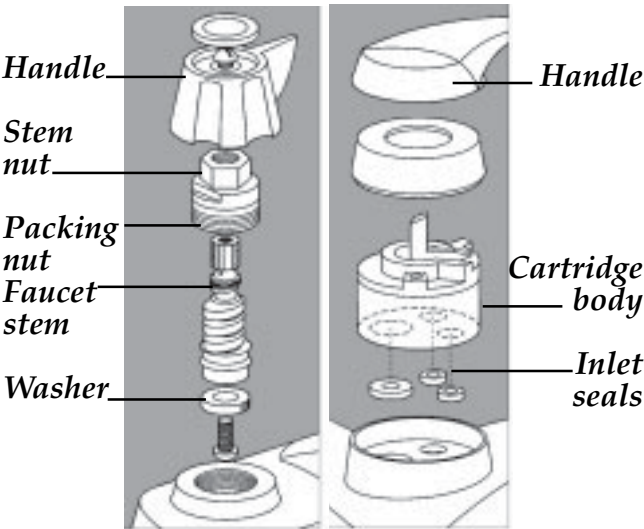
Most newer homes have washerless single-lever faucets which use a disc, valve, cartridge, or ball-and-cam assembly to control the mix and flow of hot and cold water.

To repair a washerless faucet

1. Loosen the set screw and remove the faucet handle.
2. Remove rubber inlet seals (disc faucet), valve, cartridge, or ball-and-cam assembly. Replace with a new, identical part. Reassemble rest of faucet.

Remember, all faucets are not alike. Consult a basic plumbing repair guide if you need additional help, or call a plumber for major repairs.

Repairing faucets



Repair leaking pipes

An abnormally high water bill may be the first sign of leaking pipes. Or you might hear the sound of running water even when fixtures are turned off. Make sure you check your toilets, faucets, evaporative cooler, and other water-using fixtures for leaks before you embark on a “leaking pipe” hunt.

Locating pipe leaks isn't easy; listen for running water, or look for drips, puddles, or stains on ceilings and walls. Locate hot water pipe leaks by feeling for warm spots on floors. If you find a leak, consult a do-it-yourself guide for assistance, or call a plumber.

■ *Install water-saving fixtures*

Ultra-low-consumption toilets

An ultra-low-consumption toilet uses approximately 1.6 gallons per flush, less than half of what its predecessors use. A two-person household who changes their 5-gallon toilet to one of these water-thrifty fixtures can save up to \$16 per year on their water and sewer bills and an estimated 4,900 gallons of water per year. A larger family could save even more.

These fixtures, which have been out on the market for years, have been specially-designed to use less water. The most efficient models feature a smaller tank, steeper-sided bowl, and a deep trap. Tucson and Pima County have joined several other cities and counties around the country in requiring 1.6-gallon toilets in new construction and when replacing existing fixtures. In fact, only toilets which use 1.6 gallon per flush or less are being manufactured and sold in the U.S.

Efficient showerheads

The average shower lasts 7-10 minutes. An older 5-gallon-per-minute showerhead discharges up to 50 gallons per shower. You can halve that amount by installing an efficient showerhead. These devices mix air with water to create a forceful flow at 2.5 gallons-per-minute or less, and often have a narrower spray area so more water hits the showerer. Deluxe versions feature a shutoff lever or button on the head so you can temporarily shut off the flow without having to readjust the hot and cold water mix. Local plumbing codes require 2.5-gallon-per-minute showerheads and faucet aerators in new construction and when replacing existing fixtures. With efficient showerheads there are also energy savings, which are often greater than the savings you will see on your water bill. It is an easy and wise investment with a great rate of return.

Efficient faucets

Conventional faucets flow up to 3.5 gallons or more per minute. You shouldn't have to change your faucet to conserve water, just install an aerator. Aerators mix air with water to create the sensation of a high water flow. Look for an aerator that uses 2.5 gallons or less per minute and make sure you purchase one that will fit your brand of faucet. Typically, a 1.5 gallons-per-minute aerator is appropriate for your bathrooms and 2.5 gallons-per-minute for your kitchen.

Front loading washers:

Now that toilets, showers and faucets are required to be more efficient, the washing machines offer the next best opportunity to reduce interior water use.

Unfortunately, they are still considerably more expensive than the traditional top loading washing machines. Like showerheads, much of the financial savings from front loading washers comes from reduced energy costs, most of it because the drying time is reduced significantly. Once the energy savings have been factored in, the difference in price can be quickly recovered in energy, sewer and water cost savings giving the customer a decent rate of return on their investment. Again, the larger the household, the better the return on the investment.

■ *Other water-using fixtures*

Home Water Treatment Systems

Home treatment is not necessary in Tucson to obtain safe, quality water for normal, everyday use. The local water supply meets or exceeds federal drinking water standards required by the U.S. Environmental Protection Agency (EPA). Tucson Water samples and tests the water supply daily in its state-certified laboratory.

The basic types of home water treatment systems are carbon filter, reverse osmosis, distiller (for water purification), and water softener (for water conditioning). Treatment systems have differing capacities to remove substances from water. Purification systems are designed to remove chemical impurities from water, while water conditioners simply remove minerals which leave hard water stains on glass and metal surfaces.

From a water conservation standpoint, reverse osmosis systems and water softeners waste surprising amounts of water. Only 10-25 percent of the water passed through a reverse osmosis unit is saved for your use; the rest goes down the drain. Many units keep running water to the drain after the storage tank is full. Water waste averages 14 to 40 gallons of water per day, up to 15,000 gallons a year, depending on the unit. Water softeners consume from 15 to 120 gallons for every 1,000 gallons processed. If you decide to purchase a home water purification or conditioning system, select one that wastes the least amount of water during processing. Make sure the unit shuts off after the storage tank is full, or install a shutoff valve.

Service your evaporative cooler regularly

Except during Tucson's humid, short-lived monsoon season, evaporative cooling is the most energy-efficient way to keep the interior of your desert home comfortable.

An evaporative cooler uses one-third the energy of a refrigerated air conditioner. Coolers use considerably more water. How much water? Little research has been done, but estimates range from 50 to 200 gallons per day during the cooling season, depending on such factors as home size and construction, cooler location, and occupants' lifestyles.

Evaporative cooler maintenance

Proper maintenance is vital to your cooler using water efficiently. Service your cooler according to manufacturer's instructions, or use these basic guidelines. If you need more help, consult a do-it-yourself guide or cooler maintenance firm staff.

■ *Before cooling season (Spring)*

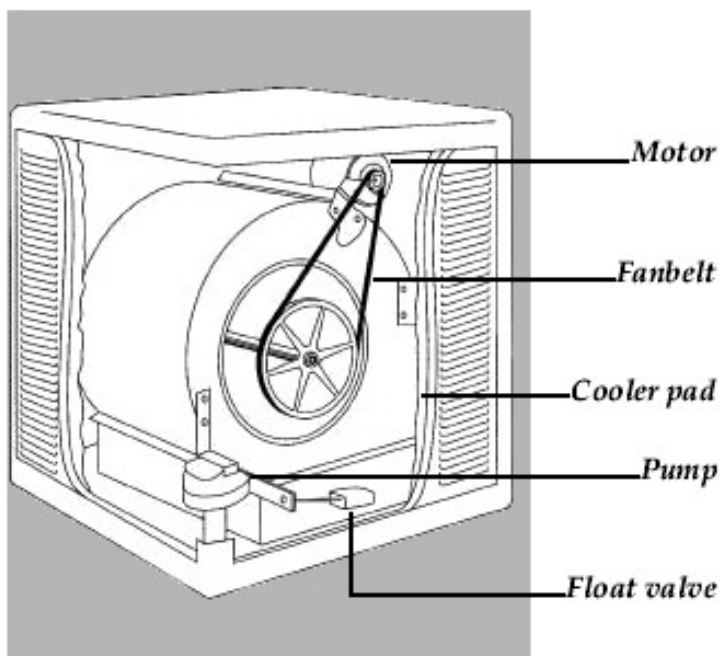
1. Uncover cooler and reconnect water line.
2. Open cooler. Check tension of motor's fanbelt. There should be about an inch worth of tension when depressed. Lightly oil bearing on blower assembly, and the motor if it has an oil receptacle.
3. Install new cooler pads.
4. Turn on cooler and inspect float valve, motor, and recirculating pump and make sure cooler pads are being saturated evenly with water. Inspect the cooler tray to make sure there are no rusted out areas or split seams to cause leaks.

■ *Middle of cooling season (July)*

1. Make sure the float valve is operating properly. A sticking valve will cause water to run continuously, overflowing the bottom tray. If you constantly hear water running, or water is running off your roof, your float valve may not be working properly.
2. Check other working parts: pump, belt tension, motor.
3. Check pad condition for salt and other mineral accumulation. You may need to change your pads twice per season, depending on how often you use your cooler. The cleaner the pad, the more efficient the evaporative cooler. Check for even water distribution over the cooler pads.
4. If your cooler has a "bleed-off valve" to drain part of the recirculating water to prevent excessive mineral buildup, make sure it is adjusted properly to drain no more water than is necessary. Check manufacturers' recommendations for the best results. Bleed-off water may contain mineral levels too high for certain plants; check with local nursery staff before you use it.

If your cooler does not have a bleed-off valve, you can minimize excessive mineral buildup by completely flushing your cooler with fresh water once or twice per season, or using commercially-available chemicals manufactured for this purpose.

Evaporative cooler



■ *After cooling season (November)*

1. Add some vinegar to bottom tray to dissolve mineral buildup.
2. Drain water from bottom tray. Gently scrape out mineral buildup and cooler pad fibers with wire brush and/or putty knife. Remove and inspect cooler pad holder/trough for clogged holes.
3. Dry tray thoroughly. Inspect tray for cracks. To help prevent rusting, coat tray with a quarter-inch of roofing cement or submarine sealer.
4. Disconnect and drain the water line from the cooler to prevent lines from freezing.
5. Cover the entire cooler with plastic to protect it, and (depending on how your cooler is installed) to help prevent cold air from entering your house.

Other cooler operating tips

1. During the evening, operate the cooler fan without the pump so cool air is brought into your house without using water. When you use the cooler during the day, turn the pump on first a few minutes before you turn on the fan to re-saturate cooler pads.
2. Install a thermostat so the cooler doesn't operate beyond a pre-selected comfort level. You'll save water and energy.

Change your water-use habits indoors

Few of us need to be told what a habit is. The little things you do daily without thinking can make a big difference—especially if you’re using water.

How many times have you lingered in the shower half-asleep, with the water on full blast? Or brushed your teeth with the faucet running? Or decided you really weren’t that thirsty and poured a half-full glass of water down the drain?

Changing a water-wasting habit doesn’t have to cost money, but it might save you money in the long run. Here’s some simple ways to save water by changing your habits.

In the bathroom (where 75 percent of indoor water use occurs!):

1. Don’t use the toilet for trash. Use a wastebasket instead.
2. Take shorter showers. Install a low-consumption showerhead with a shutoff lever and use it while you soap up or shampoo your hair. Or turn off the shower while you soap up.
3. Don’t fill up your bathtub. Lower the water level a couple of inches, or even by half.
4. Don’t let the water run while you brush your teeth or shave. Fill a glass of water, or the bathroom sink for shaving.
5. Put a bucket in the shower to catch “cold” hot water. Use it to water plants.



Young water savers can help their parents save money and water. it's never too early to be water smart!

Little Mimi knows a glass of cold water from the refrigerator, and not from a running faucet, saves water and tastes delicious on a hot summer day.



In the kitchen:

1. Wash only full loads in your dishwasher. If your unit has different wash settings, adjust it to the type of items you are washing. For example, a light wash cycle uses about 9 gallons of water per load compared to a pot-scrubber cycle, which uses 16 gallons per load. If you are shopping for a new dishwasher, make sure it has a variety of wash settings, and learn how to use them.
2. If you wash dishes by hand, fill one sink with clean water for rinsing, or use a separate basin. Don't let the water run while you rinse.
3. Fill the sink to clean fruits and vegetables instead of letting the water run.
4. Keep a pitcher of water in the refrigerator instead of running the tap for a cool beverage. Have you poured yourself a glass and decided you weren't that thirsty? Find a thirsty plant or put the rest of the water in your pet's dish.

In the laundry room:

1. Wash only full loads. Adjust your water level setting to the size of the load. Find a washer with an "infinite" water level setting the next time you need to shop for one; it will give you the most flexibility while using the least possible amount of water.

The chart below lists approximate water consumption of various activities. Think about how many times you use water daily. You'll be surprised how quickly the gallons add up. Also study the water-thrifty use column of the chart; by changing a few habits, or installing water-saving fixtures and/or devices, you can easily shave gallons off your daily consumption.

TABLE 2: Daily water consumption of various activities

<i>Activity</i>	<i>Conventional use</i>	<i>Water-thrifty use</i>
<i>Brushing teeth</i>	2 or more gallons (tap running)	1 / 4 gallon or less (tap off; use glass)
<i>Shaving</i>	20 gallons (tap running)	1 gallon or less (fill sink)
<i>Showering</i>	50 gallons (conventional showerhead, 5 gallons / minute; 10-minute shower)	12.5 gallons (water-saving showerhead, 2.5 gallons / minute; 5-minute shower)
<i>Bathing</i>	36 gallons (full tub)	18 gallons (half-full tub)
<i>Flushing toilet</i>	3.5-5 gallons / flush (conventional toilet)	1.6 gallons flush (ultra-low-consumption toilet)
		3.3-4.8 gallons / flush (placing plastic 1-liter bottle in toilet tank, or using displacement bags—saves about 1 quart / flush)
<i>Washing dishes by hand</i>	30 gallons (tap running; 3.5 gallons / minute conventional faucet)	5 gallons (wash and rinse in filled sink or dishpan; using faucet with 2.5 gallon / minute aerator)
<i>Using dishwasher</i>	16 gallons / load (full or pot- scrubber cycle; partially loaded)	9 gallons / load (light wash or short cycle; fully loaded)
<i>Washing clothes</i>	35 gallons / load (highest water level; partially loaded)	25 gallons / load (lowest water level adjusted to size of load)

Ways to save outdoors:

✓ *Use Xeriscape*

✓ *Water Harvesting*

✓ *Water Efficiently*

✓ *Keep your swimming pool maintained properly*

The Sonoran Desert is unique in its rugged terrain, striking desert plants, and dramatic climate. In Tucson, a special appreciation for the varied, sculptural forms of the desert is evoked in landscapes at homes and along roadsides and medians throughout the City. These landscapes reflect the richness of the Sonoran Desert, not the rocks and cacti typically associated with deserts. And like the desert, these landscapes differ from traditional landscapes with large lawns and thirsty trees and shrubs.

Roughly 50 percent of our daily water use in the summer is used outdoors, mostly for irrigation. The plant and gardening decisions we make will determine how high our water bills are each month, (see graph on page 5) and, impact how efficiently we use our limited water resources. Here are ways each of us can reduce our outdoor water consumption.

Five ways to save water in the landscape

1. Use Xeriscape landscaping principles.
2. Use a water-conserving landscape design and maintain your irrigation system.
3. Water efficiently.
4. Use rainwater harvesting techniques.
5. Change your water-use habits outdoors.

Use Xeriscape landscaping principles

A sensible new approach to landscaping is being adopted nationwide with the goal of achieving water conservation through creative Xeriscape landscaping. By combining the following seven principles, beautiful, healthy, and even lush landscapes can be created which use little water.

Xeriscape landscape principles

1. Plan a water-conserving design.

The key to planning a water-conserving landscape design is to group plants with similar water needs. This is called the zoned planting concept. Higher water use plants are placed close to the house in the “mini-oasis zone” for greater energy savings and enjoyment. Other plants are grouped according to their water needs with lowest water use plants in the outermost zone.

2. Limit turf.

Keep lawn size to a minimum and plant it where it can provide maximum benefits such as cooling or recreational use. Consider converting areas of nonfunctional turf to colorful, low-water-use plants.

3. Install an efficient irrigation system.

Drip irrigation is the most efficient method for irrigating trees, shrubs, and ground covers. Drip systems apply water slowly and directly to plants’ root zones, promoting deep, healthy root growth and drought-tolerance and are ideal for slopes. Used in conjunction with an automatic timer, drip systems offer the greatest flexibility and best control of watering.

4. Improve soil.

Adding organic amendments such as fir mulch, leaf mold, or compost will increase the soil’s drainage and water retention capabilities and provide nutrients to plants. Applying mulches to the bases of plants reduces evaporation and protects roots from temperature extremes.

5. Choose low-water-use plants.

A Xeriscape landscape doesn’t mean a “Zeroscape” landscape! There are hundreds of desert-adapted species with enough color, variety, and beauty to suit any landscape style. Consult staff of established nurseries, arboretums, and demonstration gardens specializing in low-water-use landscapes, or hire a qualified professional.

6. Harvest rainwater.

Rainwater can be directed to plants by land contouring, channeling, and creating depressions around the bases of trees. These simple techniques can reduce runoff, save water, and help provide a pleasing design. Slope driveways, sidewalks, and terraces so that rainwater drains toward plants.

7. Maintain landscape.

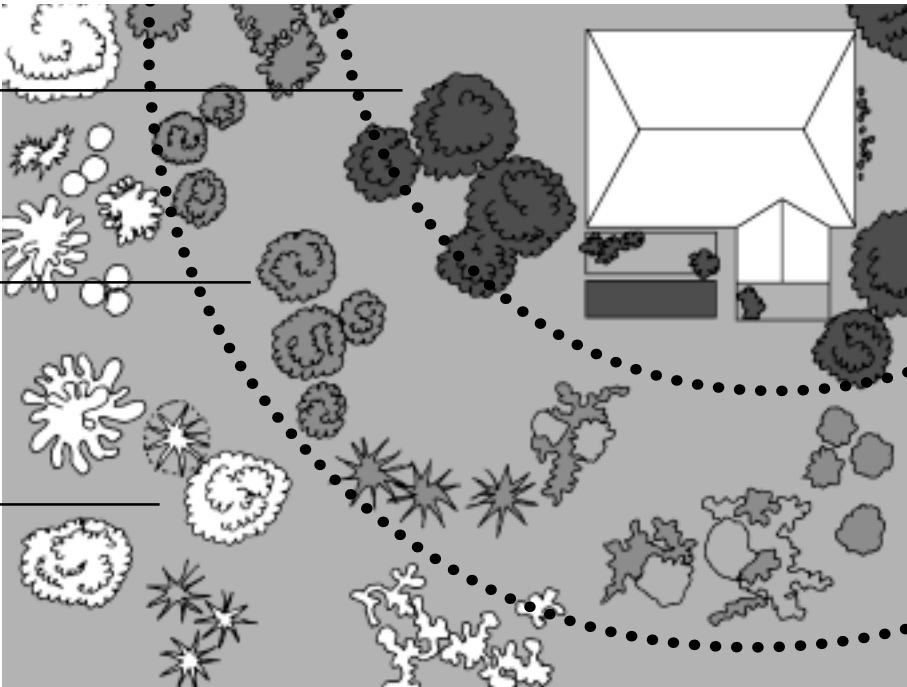
Careful weeding, pruning, fertilizing, and pest control will ensure a healthy landscape and increase water savings.

Xeriscape landscape principles

Zone 1 —————
Mini-oasis:
lush garden
and shade trees

Zone 2 —————
Low water-use
ground covers
and shrubs

Zone 3 —————
Drought-
tolerant
native
vegetation



Design and maintain your irrigation system for maximum efficiency

Much water used outside during the summer in Tucson is wasted because of inefficient irrigation. A good way to save money and water is to design your irrigation system properly and to inspect the system regularly. Here's a checklist for designing and maintaining irrigation systems:

Design tips

1. Place plants with similar watering needs and rooting depths on the same valve. *Placing plants with different watering needs, such as trees with ground covers, is the number one design problem that limits the effectiveness of drip irrigation systems. Always place lawns on a separate valve!*
2. Purchase an automatic irrigation timer and learn how to use it. Used properly, automatic timers save time, water, and money and help ensure your landscape will thrive.
3. Consider installing an automatic rain shutoff valve to prevent the irrigation system from turning on when it rains.
4. Avoid planting grass in strips less than 8 feet wide. It is difficult to efficiently irrigate narrow strips with sprinkler irrigation. Such areas are more appropriately planted with low-water-use plants and irrigated with either drip or bubbler systems.
5. Set sprinkler heads vertically to achieve uniform coverage.

If you plan to design and install your own irrigation system, ask for advice from an established retailer specializing in state-of-the-art materials, including backflow prevention devices. Backflow devices prevent contaminants from being siphoned into the potable water system and are an important part of your drip irrigation system. Contact the City of Tucson Development Services Center (791-5550; ask for the permit section) for backflow prevention device code requirements. Tucson Water also offers workshops on drip irrigation, plant selection, and automatic timers. Call 791-4556 for more information. Or, visit our web site at: <http://www.ci.tucson.az.us/water>

Maintenance tips

Plants die, they grow, animals may gnaw on your tubing, parts break and the weather changes. Your irrigation system needs to be well maintained if you hope to irrigate efficiently.

Spray Irrigation Maintenance List:

1. Check regularly for misaligned or broken sprinkler heads to avoid watering your sidewalk, street, or driveway.
2. Make sure nothing is blocking the sprinkler heads.
3. Look for wet spots to help you find leaky or broken pipes, valves, and fittings. If water is seeping out of the sprinkler head when the system is off, the valve may not be closing properly.
4. Replace broken sprinklers with the same parts or their equivalent. By using matched precipitation rate heads, the sprinkler system applies water more evenly, which helps avoid overwatering to compensate for dry patches.
5. If you have a sloped yard or compacted soil, you can avoid runoff by using short, repeated irrigation cycles.
6. If, when your system is running, the sprinkler heads put out a mist instead of droplets then the pressure may be too high. If the spray does not reach the other sprinkler heads, the pressure may be too low. This tends to leave dry spots or areas which look like donuts. The tendency is to water longer which just wastes water. It is better to water the dry spots with a hose.

Drip Check List

1. Emitters sometimes become clogged up with mineral deposits or dirt. Be sure the emitter is in fact applying water. To help avoid clogging, you should remove the end cap on your drip system and flush the lines once a year.
2. The emitter regulates the flow of water to your plants on your drip system. Sometimes the emitter falls off or breaks resulting in too much water going to this plant and not enough water going to other plants. Replace the missing or broken drip emitters with the same parts or their equivalent. Use matched pressure-compensating emitters.
3. Despite our best efforts, sometimes plants die. If you have an emitter watering a dead plant you should cap the emitter.
4. Sometimes the tubing is disrupted and the emitter is not actually watering the intended plant. Make sure the water can actually be used by the plant.
5. The emitter should not be placed too close to the trunk of the plant. They should be located near the outside of the root ball. As the plant grows, especially trees, be sure to move the emitters further away from the trunk, near the outside of the canopy.
6. Be sure to leach your soil periodically to prevent salt buildup near plants' root zones. Because of Tucson's minimal rainfall, our soils are especially susceptible to this condition. Plants which are growing in a soil of high salt content will have dark, burnt-looking patches on the edges of their leaves. Leach your soil by doubling your irrigation time to carry salts away from root zones. As a general rule, leach once a month from May to September, unless a good rain does it for you.

Water efficiently

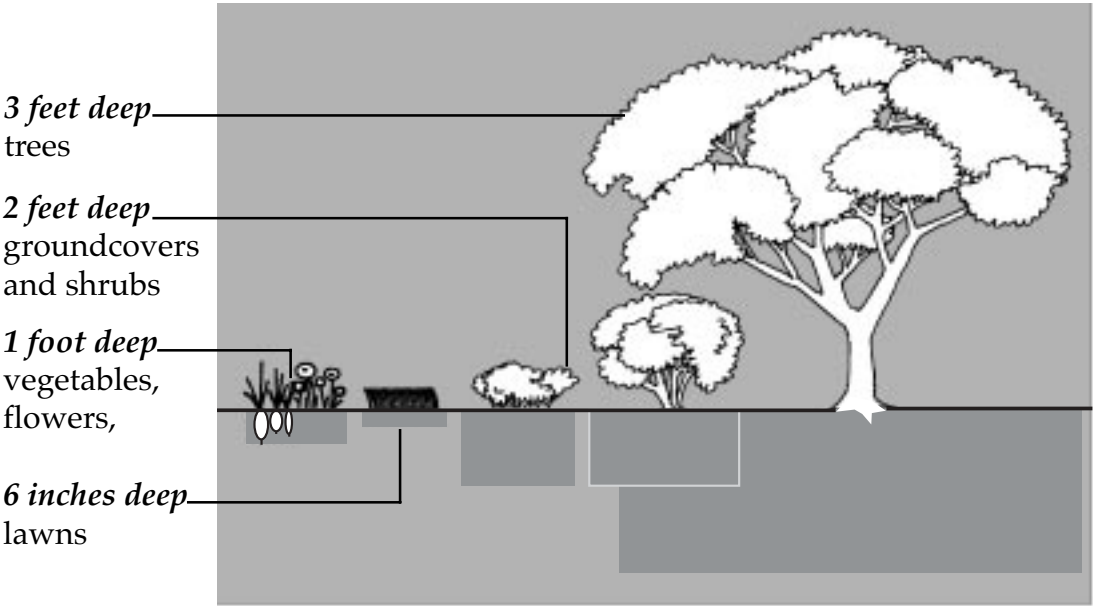
A question homeowners frequently ask about their landscape is "how much should I water?"

Unfortunately, there is no formula for watering plants. Plants' watering requirements vary according to size of plant, age, exposure, soil, location, weather, and other factors. Yet, there are some basic watering guidelines which will conserve water and maintain plant health.

1. Don't over water; it is the most common cause of lawn and plant disease. Visually inspect plants about twice per week during the summer and less frequently in the winter. Plants show signs of stress when they need water. Grass will lie flat after being walked on and will change color; leaves will drop, droop, or lose their gloss. The correct time to water is when plants need it.

2. During the summer months, water in the early morning, between 2 a.m. and 9 a.m., to reduce evaporation.
3. Water slowly, deeply, and infrequently to increase plants' rooting depth. The more developed the root system, the more drought-tolerant the plant becomes because it can draw water from a larger area.
4. Irrigate trees and shrubs longer and less frequently than shallow-rooted plants. But remember, new plantings will require more frequent irrigation until established, which takes at least two years. Native or desert adapted trees and shrubs, once they have been established or have reached the desired height and size, can make do with very little supplemental watering, if any at all. In fact, that is one of the reasons why we chose these kind of plants in the first place.
5. Use a hose shutoff nozzle when moving a hose from plant to plant.
6. Don't guess if the soil is wet—dig in the dirt! Let the soil dry out between waterings and monitor it with a soil moisture probe such as a long screwdriver or a 3-foot metal rod. The probe should easily slide through the wet soil and become difficult to push when reaching dry soil. As a general guide, water trees to a depth of 3 feet, shrubs to a depth of 2 feet, and ground covers to a depth of 1 foot, and turf to a depth of 6 inches.

Efficient watering depth



- 7 . If you have a time clock, adjust it as the weather changes, at least four times per year to give your plants only the amount of water they need. Ideally, it should be adjusted monthly. Inspect the time clock at least once a month to make sure it is operating properly. Remember, less irrigation is generally required in December, January, and February. Bermuda grasses are dormant in the winter and will only require water once a month, if it does not rain.

Guideline for Watering Trees, Shrubs, and Groundcovers

As mentioned above, there is no precise formula for watering plants, just strategies and observations. There are, however, some general guidelines which can help you schedule your waterings which appear in the tables below. Notice that the time between waterings grows longer as the plants mature. And, as the plants mature they may need more water each time you water, but, they need it less frequently. Again, it is important to note that you should water deeply and infrequently to encourage root development and to keep an eye on your plants and probe the soil.

Watering Guideline for Shrubs and Groundcovers

TEMPERATURE	1ST YEAR	2ND YEAR	AFTER 2 YEARS
Below 75 degrees	Every 2 Weeks	Every 3 Weeks	Every 30 Days
75-90 degrees	Weekly	Every 2 Weeks	Every 3 Weeks
91-100 degrees	Twice a week	Weekly	Every 2 Weeks
Over 100 degrees	Three times a week	Twice a week	Weekly

Watering Guideline for Trees

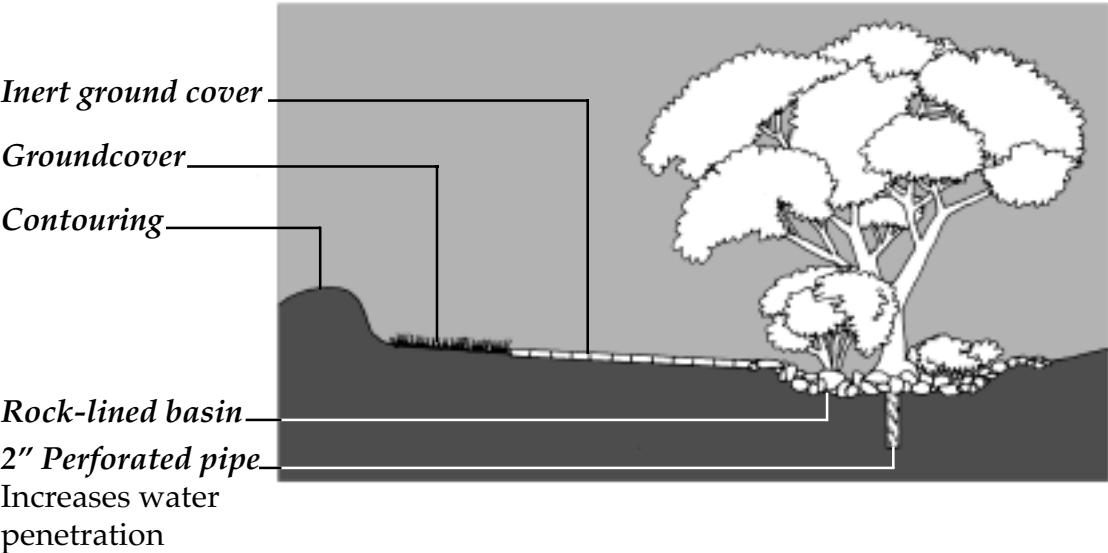
TEMPERATURE	1ST YEAR	2ND YEAR	AFTER 2 YEARS
Below 75 degrees	Every 2 Weeks	Once a Month	Water if no rainfall within 60 days
75-90 degrees	Every 5-7 Days	Every 3 Weeks	Water if no rainfall within 60 days
91-100 degrees	Weekly	Every 2 Weeks	Gradually extend intervals between waterings to every six weeks
Over 100 degrees	Twice a week	Weekly	Gradually extend intervals between waterings to every four weeks

*These guidelines assume you have watered to the recommended depth.
Source: AMWUA, "Complete Guide to Home Water Management"*

Use rainwater harvesting techniques

Rainwater harvesting is capturing and /or storing rainfall to irrigate plants. It is one of the oldest known gardening techniques. Native Americans diverted runoff into fields to grow such crops as tepary beans and blue maize. Rainwater harvesting will help you save money by reducing the need to water landscape with municipal water.

Landscape Contouring



Ways to harvest rainwater

There are two main methods of harvesting rainwater: landscape contouring and using your rooftop.

Landscape contouring

Contour (or slope) your property to direct water to landscaped areas. Use hand tools to make small canals or depressions to further direct water to specific plants. Make sure water doesn't pond next to your home's foundation. Keep water from escaping by building berms or mounds of soil. Remember to create depressions, not dams, around trees to harvest water. Dams will keep water from your trees.

Rooftop catchment

You can use your roof to capture water and channel it directly to plants, or to a storage container for future use. Make sure your gutters and downspouts are adequate by following these basic guidelines:

Gutters:

1. Use a minimum 5-inch-wide gutter.
2. Provide a minimum slope of 1/16-inch per foot.
3. Use gutter hangers every three feet.

Downspouts:

1. Use 1 square inch of downspout for every 100 square feet of roof area.
2. Space downspouts along every 20 feet of gutter.
3. Use a hanger at the top and bottom of each downspout.
4. Use a wire basket strainer where the gutter meets the downspout to catch leaves and other debris.

If you're going to use the captured rooftop water right away, remember to contour your landscape so water flows from the downspout to plants.

Or, you can store the water for future use.

Storing rainwater

Rain gutters and downspouts can move water to storage containers for an alternative watering source during dry periods. Examples of containers include 55-gallon steel drums, oak barrels, or cisterns (underground storage tanks). For a simple storage system, place a 55-gallon drum or barrel under a rain gutter downspout. Put a spigot in the container so you can attach a hose and direct water to plants. Or, a drip irrigation system can be attached to enable you to get water from the storage container to the plants.

Although a water surplus available at the right time of year makes storage practical, water stored for long periods of time will stagnate and become a health hazard. Compiling a water budget will help you decide whether storage can or should be a part of your harvesting system. Compare your total amount of water available (estimating rainfall) in a given month to that month's total landscape requirements. If you have a surplus that can be used in a reasonable amount of time, you should consider a storage system.

Plan your system before you start

Draw a site plan, to scale, to help plan your water harvesting system. Show the location of your house or other buildings, sidewalks, and other catchments that will carry water. Show water flow directions across each surface. Designate landscaped areas, types of vegetation, and number of plants. The plan will ultimately help you decide where and how to direct rainwater, or where to store water should you decide storage is possible.

System maintenance

Regular maintenance is critical to any dependable water harvesting system. Make sure your gutters and downspouts are free of trash and dirt. Periodically repair berms and canals to prevent runoff and erosion. Make sure water isn't ponding along building foundations.

Change your water-use habits outdoors

Small changes in our daily habits add up to a big difference in our water bills. Here's some simple tips any homeowner can use to reduce water bills and to conserve water.

1. Sweep, don't hose your driveway; spot-clean paved areas with a bucket of sudsy water and a brush.
2. Use a pail of water to wash your car instead of letting the hose run. Use the hose only to rinse off the car. Use an automatic shutoff nozzle on the hose.
3. Protect tender plants, such as young vegetables, from hot sun by covering them with shadecloth.
4. Use soaker hoses if you cannot install a drip irrigation system. Although not as efficient as drip irrigation, they are inexpensive and easy to use between rows of vegetables or around big trees.

Shade buildings, outdoor areas with landscape elements

In hot arid climates like Tucson, people crave cool outdoor retreats to escape the blistering summer sun. There are various ways to cool outdoor areas. Next to building ramadas, the most common and water-conserving method is to plant trees to shade buildings and outdoor living areas.

The benefits of shade trees

One well-placed tree can transform a patio or deck from a glaring hot spot to a shady oasis. In addition to enhancing the comfort of outdoor living, buildings shaded by trees require less air conditioning which can mean big energy savings.

The benefits of planting a tree multiply over time. As the tree grows it provides more shade and it needs less water once it's established and has reached a desired height.

However, pick your trees carefully. Recent studies show that watering requirements are an important factor when selecting shade trees in the Southwest. Using high-water-use trees for shade is not always economical because water costs can exceed energy savings. Significant water and energy savings are possible by planting low-water-use trees such as palo verde and mesquite. Low-water-use plant lists are available from Tucson Water's Conservation Office (791-4556).

Planting trees also benefits the community. During the 1970's, public concern about the water supply and rising water rates contributed to a decline in traditional landscaping in Tucson characterized by large lawns and trees. Landscapes shifted to a predominance of rocks and cacti with very few shade trees. While more water-conserving, these "Zeroscapes" diminished the benefits provided by trees and other vegetation: beauty and shade, filtering the air, reducing dust, runoff, and glare; and counteracting the harmful effects of increasing carbon dioxide emissions. According to recent studies, the long-term benefits of large-scale tree planting programs may be more than two-and-a-half times greater than its costs.

The trend now is shifting to a lusher but more responsibly vegetated city with a predominance of desert-adapted species. Here are a few things to keep in mind as you think about landscaping for outdoor cooling and energy conservation.

1. Use desert-adapted trees, shrubs, and vines close to the house to create a cool and shady mini-oasis.
2. Select trees with a broad spreading canopy and a dense crown to minimize sun exposure on buildings.
3. Choose deciduous trees for east and south-facing walls to provide shade in the summer and to allow for the sun's warming rays in the winter. For west-facing walls, select evergreen or deciduous trees. Vines also can provide shade and cooling of east, south, and west walls.
4. Pick trees with non-intrusive root systems to avoid damage to underground utility lines and building foundations.

Watering outdoors in the early hours of the morning is good for your plants and your pocketbook!



Mist cooling systems

Mist cooling systems recently have become available to local homeowners as an outdoor cooling alternative. Typically installed around patios or outdoor seating, mist coolers operate much like an evaporative cooler, using water to cool surrounding air. Water is pumped through the system and released in a fine spray which evaporates, forming cool barriers against hot, dry air.

Mist coolers offer a quick fix for outdoor cooling, but the homeowner will pay the price in higher water bills. Studies show that mist cooling systems dramatically increase water use. A typical mist cooling system uses two gallons of water per minute to cool 1,000 square feet of patio area, or 720 gallons a day when operated for 6 hours. Total monthly consumption would be 21,600 gallons, more than three times what an average residential homeowner uses in Tucson during the summer. And remember the graph on page 8. You will pay a premium for this water!

Although mist coolers are not the best outdoor cooling option, here are some guidelines to make sure a system is operated efficiently.

1. Make sure nozzles are directed properly so that the system only cools the area intended.
2. Operate the system only when people are using the area.
3. Maintain the system properly following manufacturer's recommendations.

Maintain your swimming pool properly

Swimming pools use water during filling and through evaporation. An average-sized uncovered pool (about 400 square feet) will evaporate the equivalent of its volume of water (or about 16,000 gallons of its 20,000-gallon total capacity) per year.

Use a pool cover to reduce evaporation. Covering your pool from September through May can prevent up to 9,800 gallons of water from evaporating. Covering your pool also will keep it cleaner. Don't overfill your pool to minimize water loss from splashing.

Keeping your pool clean will keep its filter clean. Skim leaves and other debris frequently from the pool's surface, and empty leaf baskets. The cleaner you keep your filter, the less often you'll need to clean or backwash it, which often consumes a lot of water (especially if you have a sand filter, which can remove up to 300 gallons from the pool per backwash). In most cases, you can "harvest" the backwash water by using it on established lawns, trees, and shrubs, as long as your chlorine level is not over 3 parts per million (take a water sample to your pool supply store for testing). Ask pool supply store staff for more information on water-saving "over-sized" cartridge filters.

Reusing water:

✓ *Use a greywater system to water plants*

✓ *Greywater do's*

✓ *Greywater don'ts*

Use a greywater system to water plants

Greywater is wastewater from showers, tubs, bathroom sinks, and washing machines. It is not water from kitchen sinks or toilets—water from kitchen sinks generally is too greasy and water from toilets is considered black water and should always be directed into sewer lines or a septic system. Each of us produces 20-40 gallons of greywater per day, or about 10,000 gallons of greywater per year.

Greywater's use to irrigate landscaping is becoming increasingly popular. Greywater contains phosphates and other compounds which can provide nutrients to plants. However, greywater is untreated and contains bacteria and other organisms. Because it is untreated, greywater must be provided to plants below the surface by a mini-leachfield, which, when properly designed, keeps greywater distribution below-ground. Under current regulations, a permit to use greywater in Tucson and in Pima County is required from the Pima County Department of Environmental Quality (740-3340). Permit and other information should be obtained from this department before you construct your system.

A simple greywater system can be installed on washing machine drainlines. The system consists of:

1. Three-way manual diverter valve;
2. ABS piping and/or rubber drain;
3. Filter (such as a nylon stocking);
4. Covered solids separation/surge tank;
5. Sump pump (not needed if landscaping is below the level of the surge tank);
6. Mini-leachfield.

Here are some do's and don'ts to developing, using, and maintaining a greywater system.

Greywater do's

1. Obtain permit and other information from the Pima County Department of Environmental Quality (740-3340) before you construct your system.

2. Distribute greywater below the surface. Remember, greywater is untreated and contains some bacteria.
3. Wear latex gloves when working with greywater or on the system.
4. Use a stocking filter to prevent hair and lint from clogging drain and drip lines. Clean the filter twice a month, or more often if the filter becomes noticeably clogged.
5. Before you operate it, test your system for leaks with potable water. Inspect system periodically for leaks and blockages.
6. Make sure the surge tank is covered.
7. Use purple-colored pipe, or pipe wrapped with purple tape to distinguish it from other water lines. Use signs that indicate greywater is being used.

Greywater don'ts

1. Don't drink greywater.
2. Don't use softened water as greywater, because its sodium content is too high for most plants. Don't use detergents with bleach, or which have high sodium and boron levels. Concentrated levels of sodium can poison plants and eventually destroys the permeability of clay soils. To select a laundry soap, compare product ingredients on a few brands. Choose brands which contain the lowest levels of sodium and boron. Continually monitor your plants' condition. If they start showing signs of stress (dead leaf tips, a blotchy appearance), temporarily discontinue greywater use and switch to a milder soap. *A few manufacturers have developed biodegradable laundry and dish soaps specifically for greywater use.* Consult local environmentally-oriented specialty stores for more information.
3. Don't use greywater on plants known to be sensitive to this form of watering. Consult a nursery or a landscape professional for more information.
4. Don't surface irrigate or wash down paved areas with greywater. Do not sprinkle-irrigate turf.
5. Don't irrigate vegetable gardens or any item grown for food with greywater.
6. Avoid using greywater from the kitchen sink because its organic content is too high and vegetable oils or grease can clog the system.
7. Don't use greywater if any household resident has an infectious disease such as diarrhea, infectious hepatitis, or intestinal parasites.

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